182 First, through time, the gardens tend to radiate further and further
241 from any given residence point since, given the 13-year planting-fallow
361 cycle, plots near the village will be exhausted. Since the major garden resource areas lie in a crudely east-to-west direction, there will be a slow westward migration of the geographic center of garden activities, enough so that at some point, the village is suspended, as it were, among distant resource points (see Maps), and enhanced by the dispersed nature of the hunting and fishing, and to some extent the gathering, areas. If the "suspension" is weighted more in one direction than another, there will be some tendency either to move the village or to send out temporary or permanent branches of it, respectively in the form of work cottages in the swiddens or in larger long-term house groups which are intermittently occupied. This process is, in fact, easily observed among the Yaruro in existent and abandoned house and subsidiary village sites scattered over the whole territory. Similarly, the locus of gathering, so important in
[221] summer, moves further and further from the village. This, together with the considerable shift to fishing and river-hunting in summer, as well as the need for water, causes an extensive seasonal transhumance to occur within the territory. These factors contribute to fissioning as well as to inhibiting the development of permanently located villages, let alone larger aggregations. Thus, with a radiating ecology, a degree of group dispersion and geographical mobility within the territory is to be expected and is indeed characteristic of the Yaruro.

512 Second, if one examines the location of all resources it will be seen that, taken together, they constantly enjoin a dispersal of the labor force in all directions, regardless of season, so that more or less equivalent quantities of labor are being used at the same time in many varying kinds of productive activity independently of each other — at the peripheries of the territory, in the areas between, or in the village centers themselves,
[462] where the women are constantly doing the significantly important work of
[252] converting otherwise unusable food resources, like raw, bitter manioc or uncooked corn, into edibles.

476 Third, it will be noted that none of the Yaruro technological processes require cooperative work, even when they may permit it, if it were so desired. On the whole, the productive activities might be described as dispersive of labor, whether it is individuals or small groups of twos or threes who go out to keep each other company. Even the work of preparing
[241] the swiddens is carried out individually, though two or three men may
[463] work as neighbors in what appears as a single plot. Further, the technology is such as to require no highly specific and difficult or esoteric skills. The
[242] most difficult skill to acquire is the knowledge of the soil types and appropriate planting procedures attached to each. Thus, each adult is in a position to learn the inventory of technological knowledge appropriate
462 to his or her sex, and somewhat of that belonging to the other sex too, and
463 to apply it by himself whenever he wants or must. A man, well-instructed in Yaruro technology, could probably subsist alone successfully for long periods of time. One divorced adult man, although he was largely fed by his

mother's and sister's households, nevertheless hunted and harvested for himself, and often cooked for himself meals of the type ordinarily cooked only by women. 462 463

The forms and characteristics of surpluses, as defined by Harris,[16] shed further light on the structure of the ecology. The technological surplus, defined as the difference between total calories annually produced by any definable group and the calories used to produce them, or as the ratio between these two figures, may be estimated at about 8 or 9 to 1 as compared with Harris's estimated figures of 2:1 for the Sirionó or 33:1 for the Pencuyut Maya.[17] Since as Harris remarks, the degree of social stratification in a large number of cases correlates with the size of the technological surplus, we would scarcely expect to find social stratification among the Yaruro, nor even any significant ranking. Where the technological surplus is low, the producer's surplus, defined as the difference between total calories produced by any given group and the total calories used by the producers for all purposes must also be low. Therefore the number of persons other than producers who can be supported by the producers is also limited. The producers' surplus may provide an index of the degrees of specialization which might be expected. In the case of the Yaruro one would expect no, or very low, specialization. Again with a low producers' surplus, one would expect to find a greater proportion of the group involved in production than where such surpluses are high, for otherwise there would be insufficient calories to support more than a few people other than the producers. With a low producers' surplus, one would expect, in general, to find a greater proportion of both sexes engaged in the food quest. This is, of course, born out in the case of the Yaruro. Finally, Harris's harvest surplus is defined as the difference between the amount produced at any given moment, especially at seasonal maxima, and the amount consumed at that time. The actual amount consumable is governed by the seasonal *minima*, since the population cannot rise higher than the food supply at minimum periods permits unless special technological features such as storage, are present. Where the harvest surpluses are of non-storable goods, the population level is in equilibrium with the absolute minima of the harvests. The greater the degree of storability through a nonproductive season, or the less marked a crop is by seasonality, the higher the level to which the minimum population can be raised as compared with the number of people supportable at levels of production comparable to those at the time of harvest. Storability, however, is only one dimension of the harvest surplus. Absolute size of the peak surpluses, their regularity over the years, their distribution in space and time in the annual cycle, their utility in raw form, and the proportion of labor needed to harvest them relative to the time allotted for the harvest are all important dimensions of the harvest surplus. Thus, manioc, the Yauro's chief food resource has no clear peak, is regular over the years (the Yaruro disclaim any famines), is storable both in raw form and in prepared forms, is, in the case of the Yaruro, so located as not to permit of a concentration of labor at any one time and needs no massive labor for harvesting because of short harvest periods. Thus, in general, the very nature of manioc as a crop, and the labor requisites for

121 433 182 [56] [463] [462] [262] [251] [241]

16, 17 [For footnotes see p. 43, category 116--Analyst]

and then shooting into the still side pools of a stream into which he has driven a post with bait attached. He may also stand in a canoe to shoot. It is reported, though I have not myself seen it, that barbasco (*Jacquinia revoluta* or *macronulata*) poison is used by some Yaruro.[13] No nets, weirs, traps, sweeps, or artificial fish pools are used.

Given the techniques and tools of the Yaruro, all the subsistence activities described can conveniently be done by one person. Some *must* be done by one person only, since the tools and techniques themselves do not permit two or more persons to operate jointly. As it were, the logic of the tools and techniques concerned demands utilization by single persons.[14] Some of the tools and techniques might conveniently involve two or more persons, e. g. lashing tree trunks together to make a fence or cornering a capybara, but do not definitively *require* more than one person. Activities of all sorts may be done by aggregates of persons, each utilizing his own tools and techniques individually but neither the activity, the tools nor the techniques entail the aggregation of individuals. Thus, from the point of view of human organization, the technology, by itself, entails no managerial functions, no coordination of tasks which must be overseen by someone occupying an appropriately defined status.[14] That is, there are no technologically determined positions of leadership in Yaruro society. Further, the technology as such entails no significant cooperation in work organization, even when this is convenient, and correspondingly, no standard work groups or management functions, as represented in some defined status, for facilitating cooperation are to be expected or to be found. In fact, Yaruro technology and resource distribution are such as to elicit considerable dispersion of activities and actors at any given time of work, and to inhibit the development of rank and the personal acquisition of superordinating prestige.

IV

We may now examine the habitat aspect of the ecological relationship. A clearly marked annual cycle occurs in the Yaruro habitat.[15] However, despite a sharp seasonal change from heavy rains up to 60 inches in one half of the year to almost

[13] Personal communication from Mr. Thomas Rootes who has studied Yaruro linguistics for a number of months, having visited several groups.

[14] Different kinds of tools require different kinds of organization. A simple hand saw can be used by only one person at a time. A logging saw, though it can awkwardly be used by one person, is surely best used by two persons. Certain other saws, e. g. jig saws, make up one of a series of machine processes on a single part of a product, the entire series being the unit of operation which requires a still more complex level of organization. Cf. Leeds, 1960 b.

[14] For the structure of argument which is involved here, see Leeds, 1960 b.

[15] 'Habitat' here refers to all physical objects and conditions of the environment which are relevant to the existence or production of resources as defined by the culture. For the most part, then, 'habitat' refers to those environmental conditions such as humidity, temperature, insolation, rainfall, etc., which affect the food supply, as well as the food and water available for animals and plants and other culturally relevant physical objects. By extension, it refers to daily, seasonal, annual, and long-term variations and cycles in the various relevant factors of the environment, whether climatic, geologic, or biotic, which affect any of these supplies.

221 262 Finally, the Yaruro deny any considerable long-term oscillations in the environment and consequently in the resources. The extremes, particularly the minima, of habitat factors which regulate food and population balances, according to Liebig's Law, fall within narrow limits and again elicit no special institutions of management or of equilibrium maintenance to compensate for them, as in the case of the potlatches of the Northwest Coast of America, the buffalo hunts in the Great Plains of the United States, or the use of pigs in Melanesia.[23]

VI

868 One more point may be made regarding the ecology as limiter of chieftainship among the Yaruro. The tools, techniques, and resources require no very extensive, highly specialized or esoteric knowledge. In fact any man or woman, and any child as well, has access to such knowledge, and it is easily acquired by all members of the society who thus have, at least potentially, equal access to control over the means of life. There is no specialized knowledge, at least with respect to technology and habitat, which requires a specialized repository in the form of a chief or learned person. Yaruro knowledge, itself dependent upon the inventory of tools, techniques, and resources, inhibits any tendency towards the development of any [463] sort of specialists in technical or managerial knowledge. As one might expect, there are no true specialists in Yaruro society. Here and there women make pots and certain women seem to have a special bent for making woven sacks but these [756] are not properly specialities. Nor, from a technological or ecological point of view, is male or female shamanism in any way a speciality. They do not appear to be specialists even in esoteric knowledge. Knowledge of the general type described here might be called 'dispersive' or 'egalitarian' since it tends to become more or less uniformly distributed among the members of the society. A consequence of the existence of this type of knowledge, associated with the kind of technology described, is that there will be no specialised training of any specialists and, of course, no specialised personnel to do such training. This is the situation which obtains among the Yaruro both with respect to technical and managerial activities. Thus, in Yaruro knowledge, there is no source for the support of an institutionalized and strong chieftainship.

VII

221 241 361 622 In one respect, the ecology encourages chiefly functions. A balance is struck between the cultural resources, the possibilities that the habitat affords for their production, and the length of time that areas of land can be exploited. This is particularly true of the horticultural lands since they can no longer be used after three years of cropping, and it becomes necessary to move on. The result is that there is a slow migration of resource areas, chiefly of horticultural areas across the tribal territory. The lands in cultivation move further and further from any given village until a point of suspension is reached at which the walking and working

[23] Cf. Suttles, 1960 a, 1960 b; Llewelly and Hoebel, 1941; Vayda, 1961; Vayda, Leeds, and Smith, 1961.